JP59115863

Publication Title:

PLANE SCANNING TYPE INK JET RECORDING APPARATUS

Abstract:

PURPOSE:To provide the titled apparatus for preventing the drying of the ink in the nozzle of a printing head even if the printing head or a platen is not moved, constituted by providing a capping mechanism and an ink recovery mechanism in a hollow platen.

CONSTITUTION:A capping mechanism and an ink recovery mechanism are provided around a shaft 110 in a rotatable manner so as to be communicated with the nozzle surface of a printing head 101 from the opening part 105 provided to a part of the peripheral surface of a platen 104. In a stand-by state, the ink recovery mechaism constituted of a box shaped ink receiver 109 is directed to the nozzle surface 103 through the opening part 105. In a stopped state, the capping mechanism constituted of a cap member 106, the drive means 107 thereof and a double-seat spring 208 is acted on the nozzle surface 103 through the opening part 105.

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⑲ 日本国特許庁（JP）　　⑪実用新案出願公開

⑫ 公開実用新案公報（U）　　昭59—115863

⑤Int. Cl.³	識別記号	庁内整理番号
F 02 M 61/14		8311—3G
F 02 F 1/24		7616—3G

⑬公開　昭和59年(1984)8月4日

審査請求　有

（全 1 頁）

⑭燃料噴射弁の固定構造

⑳実　　願　昭58—9676
㉒出　　願　昭58(1983)1月26日
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㉔代 理 人　弁理士　柳田征史　　外1名

㊧実用新案登録請求の範囲

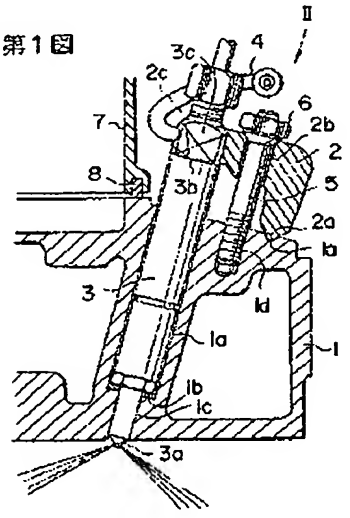
軸心に対して傾斜した噴射孔を有する燃料噴射弁の一部に一端が当接しエンジン本体に他端が当接する押え部材を、この押え部材に穿けた孔に挿入したボルト等により締め付けて前記燃料噴射弁をエンジン本体に締着する燃料噴射弁の固定構造において、前記押え部材の一端に前記燃料噴射弁の回転を規制し且つ下方に押圧する押圧部が設けられ、前記他端にはエンジン本体との当接部を支点として前記押え部材を揺動せしめる肩部が設けられ、前記押え部材に穿けた孔が前記ボルトを緩挿する貫通孔であるとともに、前記肩部とこの肩部に当接するエンジン本体側にはいずれか一方に突起が設けられていることを特徴とする燃料噴射弁の固定構造。

図面の簡単な説明

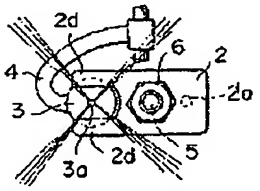
第1図は本考案の実施例の断面図、第2図は第1図における矢印Ⅱでの方向視した平面図、第3図は本考案による押え部材肩部の他の例を示す斜視図である。

1……エンジン本体、2……押え部材、2a……肩部、2c……押圧部、3……燃料噴射弁、5……スタッド、6……ナット。

第1図



第2図



第3図

公開実用 昭和59— 115863

⑲ 日本国特許庁 (JP)　　⑪実用新案出願公開

⑫ 公開実用新案公報 (U)　　昭59—115863

⑤Int. Cl.³	識別記号	庁内整理番号
F 02 M 61 14		8311—3G
F 02 F 1 24		7616—3C

⑬公開 昭和59年(1984)8月4日

審査請求 有

(全 頁)

⑭燃料噴射弁の固定構造

⑳実願 昭58—9678
㉒出願 昭58(1983)1月26日

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明　　細　　書

1. 考案の名称

燃料噴射弁の固定構造

2. 実用新案登録請求の範囲

軸心に対して傾斜した噴射孔を有する燃料噴射弁の一部に一端が当接しエンジン本体に他端が当接する押え部材を、この押え部材に穿けた孔に挿入したボルト等により締め付けて前記燃料噴射弁をエンジン本体に締着する燃料噴射弁の固定構造において、前記押え部材の一端に前記燃料噴射弁の回転を規制し且つ下方に押圧する押圧部が設けられ、前記他端にはエンジン本体との当接部を支点として前記押え部材を揺動せしめる肩部が設けられ、前記押え部材に穿けた孔が前記ボルトを緩挿する貫通孔であるとともに、前記肩部とこの肩部に当接するエンジン本体側にはいずれか一方に突起が設けられ、他方にはこの突起に嵌合するくぼみが設けられていることを特徴とする燃料噴射弁の固定構造。

実開59-115863

3. 考案の詳細な説明

本考案はディーゼルエンジンのシリンダヘッドに燃料噴射弁を固定する構造に関するものであり、さらに詳しくは1個の燃料噴射弁を1個のボルトにより片持支持で取り付けるようにした構造に関するものである。

ディーゼルエンジンのシリンダヘッドに燃料噴射弁を取り付ける場合、2本のボルトで締結する構造となつている場合が多いが、2本のボルトを均等の締付力で締めることは難しく、片締め状態が生じ易い。このため、燃料噴射弁が芯ずれして噴射弁のニードルのスカツフイングを引き起こす原因となつていた。

これを防止するため、例えば、実公昭53－39782号に開示されているように、燃料噴射弁を球体を介して押え部材により押える構造として、押え部材を押えるボルトの締付力がアンバランスであつても燃料噴射弁にかかる力は均一となるようにしたものが提案されている。

しかしながら、エンジンの構造、寸法等の制約により２本のボルトを使用できない場合もある。例えば、燃料噴射弁とシリンダヘッドカバーが近づいていて、ボルトを取り付ける場所が確保できない場合等がある。さらに、１本のボルトの場合では片締めということは起こり得ないという利点もあり、このため１本のボルトで取り付ける構造として、一端が燃料噴射弁に当接し他端がエンジン本体に当接する押え部材を、この押え部材に穿けた孔に挿入したボルトにより締め付けることにより、エンジン本体との当接部を支点として燃料噴射弁に当接する他端がこの燃料噴射弁を押圧して取り付ける構造が知られている。この押え部材のボルト挿入用の孔は、孔位置誤差、ボルト取付用のエンジン本体に設けたメネジ位置誤差等の製造上の誤差を吸収するため、ボルト外径より少し大きくしなければならない。すなわち、ボルトを挿入した時ボルトと孔には多少すき間が生じる。このため、

ボルトを締めつけた場合、燃料噴射弁を中心として押え部材が上記すき間に相当する角度だけ回転することができるので、燃料噴射弁も同じ角度の回転を受けることがあり、軸心に対して傾斜した噴射孔を有する燃料噴射弁では、この回転によつて噴射方向がずれる。通常ディーゼルエンジンにおいて、特に直噴タイプのディーゼルエンジンにおいては、シリンダ室内の形状とともに燃料噴射弁の噴射方向がシリンダ室内での燃焼に大きく影響する要素であり、これらがエンジンの性能を左右すると言つても過言ではない。このため、上述の押え部材の孔とボルト外径とのすき間による燃料噴射弁の回転によつて生じる噴射方向のずれはごくわずかであつても、エンジンの始動性が悪くなつたり、所期の性能が出なくなつたりするという問題がある。

本考案はこのような問題に鑑み、1本のボルトにより燃料噴射弁を押え部材を介して片持支持で取り付けるようにした固定構造にお

いて、押え部材に穿けたボルト挿入孔とボルト外径との間にすき間があつても燃料噴射弁の取付位置および方向にずれを生じないようにした燃料噴射弁の固定構造を提供することを目的とするものである。

本考案の燃料噴射弁の固定構造は、軸心に対して傾斜した噴射孔を有する燃料噴射弁をエンジン本体に穿けた孔に挿入し、この燃料噴射弁の一部に一端が当接するとともにエンジン本体に他端が当接する押え部材を押さえ部材に穿けた孔に緩挿したボルト等により締めつけることによつて、前記他端を支点として前記一端により燃料噴射弁を押圧しこの燃料噴射弁をエンジン本体に締着する構造であり、燃料噴射弁の一部に当接する押え部材の一端に設けた押圧部によつて燃料噴射弁の回転が規制され且つ下方に押圧されるとともに、エンジン本体と当接する押え部材の他端には当接部を支点として押え部材を揺動せしめる肩部が設けられ、この肩部と肩部に当接する

エンジン本体の当接部にはいずれか一方に突起が、そして他方にくぼみが設けられていることを特徴とするものである。

本考案によれば、1本のボルトにより押え部材を介して燃料噴射弁を締め付けるので片締め状態が生じることもなく燃料噴射弁の芯ズレを防止できるとともに、押え部材の一端が燃料噴射弁の回転を規制し、他端の肩部はエンジン本体の当接部とのいずれか一方の突起が他方のくぼみと嵌合するので、押え部材が燃料噴射弁軸と直角な平面での動き、すなわち燃料噴射弁を回転させる動きが規制されて、燃料の噴射方向のズレを少なくすることができる。

以下図面によつて本考案の実施例を説明する。

第1図は本考案の実施例の断面図であるが、燃料噴射弁および取り付けボルトは断面ではなく側面を示している。第2図は、第1図における矢印IIで示す方向視した図面であり、

第１図および第２図によつて説明する。

エンジン本体１には、燃料噴射弁３をほぼすき間なく挿入させる止まり穴１ａと、この止まり穴１ａと同芯で径の小さい孔１ｃが止まり穴１ａの先端に設けられシリンダ室内と連通している。止まり穴１ａにほぼすき間なく挿入された円筒状燃料噴射弁３は、止まり穴１ａの段部１ｂによつて軸方向の位置決めがされるとともに、燃料噴射口３ａを有する燃料噴射弁の先端部は孔１ｃを通つてシリンダ室内に突出する。燃料噴射弁３のエンジン本体から外方へ出ている部分（前記噴射口3aと反対側）とフユエルパイプ４の一端が結合しており、フユエルパイプ４より燃料が送り込まれて、燃料噴射口３ａよりシリンダ室内に噴射される。さらに、燃料噴射弁３のエンジン本体から外方に出ている部分には、軸と平行で且つ互いに平行な２平面３ｃとこの平面と円筒面とを軸に対し直角な面で結ぶ段部３ｂとが設けられており、平行な２平面３ｃ

には押え部材の一端に設けたフォーク部２ｄ，２ｄがすき間なく嵌合するとともにフォーク部の下部にある押圧部２ｃが段部３ｂと当接する。押え部材２のフォーク部２ｄ，２ｄと反対側の端部には球面状突起を有する肩部2aが設けられていて、エンジン本体１に設けたくぼみ１ａと嵌合している。さらに押え部材２にはフォーク部下部の押圧部２ｃと肩部2aとの間で燃料噴射弁軸とほぼ平行な孔２ｂが穿けられていて、この孔２ｂに緩挿されたスタッド５がエンジン本体１に設けたネジ１ｄと螺合してエンジン本体に取り付けられている。このスタッド５の上部にナット６を螺合させて押え部材２を締め付けることにより、肩部２ａを支点として押圧部２ｃにより燃料噴射弁３の段部３ｂを押さえて燃料噴射弁３を固定する。スタッド５とナット６の代わりにボルトを用いてもよい。このとき押圧部2cは、段部３ｂに対し凸となる円筒面形状をしており、押圧部２ｃにより燃料噴射弁３を軸

方向に対して偏心することなく押し付けることができる。また、エンジン本体1の上部にはシール8により内部を密封してヘッドカバー7が取り付けられている。

以上のように構成した燃料噴射弁の固定構造においては、燃料噴射弁3の軸方向の動きは止まり穴1aの段部1bと押え部材2の押圧部2cによつて規制されて固定されるとともに、押え部材2の一端に設けたフォーク部2d，2dが燃料噴射弁3の平行な2平面3cとほぼすき間なく嵌合するとともに、他端に設けた肩部2aの突起がエンジン本体のくぼみ1aと嵌合しているので、押え部材2の燃料噴射弁3と直角な面内での動きが阻止されて燃料噴射弁3の回転方向の動きも規制される。すなわち、押え部材2によつて燃料噴射弁3の回転方向の位置決めを行なうことができる。

さらに、押え部材2の肩部2aの突起は、この突起を支点として押圧部2cが燃料噴射

弁3の軸方向に動くことができ且つ燃料噴射弁3の回転方向の動きを阻止できれば良いので、第3図に示すように、ほぼ半円筒状（かまぼこ状）の突起を用いても良い。この場合、肩部2aと燃料噴射弁3とを結ぶ線に直角になるように円筒面を設けて、この円筒面に沿つて押え部材2を揺動可能とするとともに、半円筒状の突起の側面で押え部材2の燃料噴射弁軸と直角な面内での動きを阻止して、燃料噴射弁3をずれなく取り付けることができる。

以上説明したように、本考案によれば1本のボルトにより燃料噴射弁が押え部材を介して押さえられて取り付けられているとともに、燃料噴射弁とエンジン本体との位置ズレが生じないようにされているので、燃料噴射弁の噴射方向を精度よく決めることができ、噴射方向のズレによつて生じやすいエンジン始動性低下、性能低下等の問題の発生を防止することができる。

4. 図面の簡単な説明

第1図は本考案の実施例の断面図、

第2図は第1図における矢印Ⅱでの方向視した平面図、

第3図は本考案による押え部材肩部の他の例を示す斜視図である。

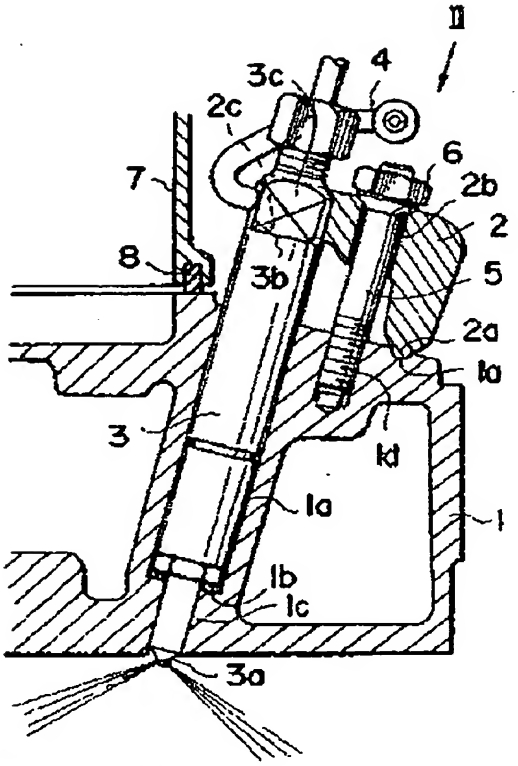
1…エンジン本体　　2…押え部材

2a…肩　部　　2c…押圧部

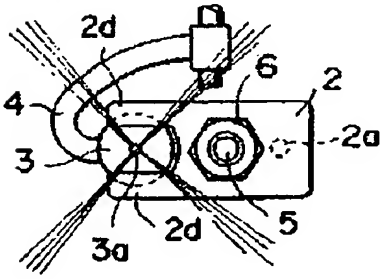
3…燃料噴射弁　　5…スタッド

6…ナット

第 1 図



第 2 図



第 3 図

[seals illegible]

4. BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional diagram of an example of embodiment of the present invention.

Figure 2 is a top view diagram viewed from the direction of the arrow II in Figure 1.

Figure 3 is an angle view diagram indicating the other side of the retention member shoulder part of the present invention.

1 . . . Main body of engine
2 . . . Retention member
2a . . . Shoulder part
2c . . . Pressurizing part
3 . . . Fuel injection valve
5 . . . Stud
6 . . . Nut

[see source for English]

Japanese Unexamined Utility Model
Application Publication S59-115863

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FIGURE 1

[see source for figure]

FIGURE 2

[see source for figures]

FIGURE 3

[see source for English]

Q79443

(19) Japan Patent Office (JP)

(11) Japanese Unexamined Utility Model Application Publication Number

(12) **Japanese Unexamined Utility Model Application Publication** (U)

S59-115863

(51) Int. Cl.[3]	Identification codes	JPO file numbers
F 02 M 61/14		8311-3G
F 02 F 1/24		7616-3G

(43) Publication date August 4, 1984

Request for examination Requested

(Total of 1 page)

(54) FUEL INJECTION VALVE SECURING STRUCTURE

(21) Application number S58-9678

(22) Date of application January 26, 1983

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(57) SCOPE OF UTILITY MODEL CLAIMS

A fuel injection valve securing structure that tightens onto a main engine unit a retention member, of which one end makes contact with one part of a fuel injection valve having an injection orifice set at a slant in relation to the axial center and the other end makes contact with the main engine unit, using a bolt, etc. inserted in a hole bored in this retention member to tighten the retention member, characterized by: providing a pressurizing part on one end of the aforementioned retention member to pressurize downward and to restrict the rotation of the aforementioned fuel injection valve; providing a shoulder part on the aforementioned other end to allow the aforementioned retention member to slide using the contact part with the main engine unit as a support point; the hole bored in the aforementioned retention member being a through-hole into which the aforementioned bolt is loosely inserted; providing a protuberance on the side either of the aforementioned shoulder part or of the main engine unit that contacts this shoulder part; and providing a depression that mates with this protuberance on the other side.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional diagram of an example of embodiment of the present invention. Figure 2 is a top view diagram viewed from the direction of the arrow II in Figure 1. Figure 3 is an angle view diagram indicating the other side of the retention member shoulder part of the present invention.

1 . . . Main body of engine, 2 . . . Retention member, 2a . . . Shoulder part, 2c . . . Pressurizing part, 3 . . . Fuel injection valve, 5 . . . Stud, 6 . . . Nut.

FIGURE 1

[see source for figure]

FIGURE 2

[see source for figure]

FIGURE 3

[see source for figure]

(19) **Japan Patent Office** (JP)

(11) Japanese Unexamined Utility Model Application Publication Number

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S59-115863

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(54) FUEL INJECTION VALVE SECURING STRUCTURE

(21) Application number S58-9678

(22) Date of application January 26, 1983

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[seals illegible]

SPECIFICATION

1. NAME OF THE INVENTION

Fuel injection valve securing structure

2. SCOPE OF UTILITY MODEL CLAIMS

A fuel injection valve securing structure that tightens onto a main engine unit a retention member, of which one end makes contact with one part of a fuel injection valve having an injection orifice set at a slant in relation to the axial center and the other end makes contact with the main engine unit, using a bolt, etc. inserted in a hole bored in this retention member to tighten the retention member, said fuel injection valve securing structure characterized in that a pressurizing part is provided on one end of the aforementioned retention member to pressurize downward and to restrict the rotation of the aforementioned fuel injection valve; a shoulder part is provided on the aforementioned other end to allow the aforementioned retention member to slide using the contact part with the main engine unit as a support point; the hole bored in the aforementioned retention member being a through-hole into which the aforementioned bolt is loosely inserted; a protuberance is provided on the side either of the aforementioned shoulder part or of the main engine unit that contacts this shoulder part; and a depression is provided that mates with this protuberance on the other side.

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3. DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a structure for securing a fuel injection valve to a cylinder head of a diesel engine, and, in further detail, relates to a structure such that one fuel injection valve is mounted using a cantilever support having one bolt.

A structure that tightens the valve with two bolts is often used when mounting a fuel injection valve on the cylinder head of a diesel engine, but it is difficult to fasten two bolts with uniform tightening force, and lopsided tightness is prone to occur. This may cause the fuel injection valve to shift off center, producing needle scuffing of the injection valve.

In order to prevent this, there have been proposals such as that disclosed in Japanese Unexamined Utility Model Application Publication S53-39782, for example, which has a structure to retain the fuel injection valve by a retention member through a spherical unit that makes the force applied to the fuel injection valve uniform even if the bolt fastening force that retains the retention member is unbalanced.

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Nonetheless, depending on the engine structure and the restrictions on dimensions, etc., there may be cases in which it is not possible to use two bolts. For example, the fuel injection valve and the cylinder head cover may be too close to each other to guarantee a place to mount the bolts. Further, with one bolt there is the advantage that lopsided tightening cannot occur. For this reason, a well-known structure for mounting with one bolt is to mount a retention member, of which one end makes contact with one part of the fuel injection valve and the other end makes contact with the main engine unit, using a bolt inserted in a hole bored in this retention member, and the part contacting the main engine unit is taken as the support point, the other end that contacts the fuel injection valve pressurizes and mounts this fuel injection valve. The hole for inserting the bolt of this retention member must be slightly larger than the external diameter of the bolt in order to absorb manufacturing error such as the hole position error and position error of the threads provided on the main engine unit for mounting the bolt. That is to say, when inserting the bolt, a slight gap is produced between the bolt and the hole.

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For this reason, when tightening the bolt, the retention member can rotate just the angle equivalent to the aforementioned gap taking the fuel injection valve as the center. Therefore, the fuel injection valve receives rotation of the same angle, and in a fuel injection valve having an injection orifice at a slant in relation to the axial center, the direction of injection is displaced by this rotation. In an ordinary diesel engine, specifically, in a direct injection type diesel engine, the shape inside the cylinder chamber and the direction of injection of the fuel injection valve are essential elements that have a great effect on combustion inside the cylinder chamber, and it is not an overstatement to say that these more or less control engine performance. For this reason, even if there is very slight displacement of the direction of injection produced by the rotation of the fuel injection valve caused by the gap between the hole of the retention member and the external diameter of the bolt as described above, such problems may appear as engine start-up difficulties and failure to achieve the expected performance.

This invention addresses this kind of problem and has the objective of offering a fuel injection valve securing structure such that the fuel injection valve is mounted by a cantilever support through a retaining member using one bolt, wherein displacement of the mounting position and of the direction of the fuel injection valve is not produced even if there is a gap between the bolt insertion hole bored in the retaining member and the external diameter of the bolt.

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The fuel injection valve securing structure of the present invention is a structure, which inserts a fuel injection valve having a injection orifice set at a slant in relation to the axial center in a hole bored in the main engine unit, retains a retaining member that has one end contacting one part of this fuel injection valve and another end contacting the main engine unit, and is tightened using a bolt, etc. loosely inserted in the hole bored in the retention member. By doing this, the fuel injection valve is pressurized from the aforementioned one end using the aforementioned other end as a support, and this fuel injection valve is tightened on the main engine unit. A pressurizing part provided on one end of the retention member that contacts one part of the fuel injection valve presses downward and restricts the rotation of the fuel injection valve. In addition, the securing structure is characterized by providing on the other end of the retention member that contacts the main engine unit a shoulder part that allows the retention member to slide using the contact part as a support point, and by providing a protuberance on the side either of this shoulder part or of the main engine unit that contacts the shoulder part, as well as a depression on the other side.

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According to the present invention, lopsided tightening does not occur and center displacement of the fuel injection valve can be prevented because the fuel injection valve is tightened through a retention member using one bolt. In addition, movement of the retention member in the plane at a right angle to the axis of the fuel injection valve, specifically, movement that causes the fuel injection valve to rotate, is restricted and little displacement of the shoulder part of the other end occurs in the direction of injecting the fuel because a protuberance of one or the other side of the part contacting the main engine unit mates with a depression of the other side.

An example of embodiment of the present invention will be explained below using diagrams.

Figure 1 is a cross-sectional diagram of an example of embodiment of the present invention, but the fuel injection valve and the tightening bolt are indicated in a side view and not in a cross-section. Figure 2 is a top-view diagram in the direction indicated by the arrow II in Figure 1, and the explanation will be given using Figure 1 and Figure 2.

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In the main engine unit 1, a stop hole 1a, into which a fuel injection valve 3 is inserted with hardly any gap, and a smaller diameter hole 1c, which is concentric with the stop hole 1a and is provided at the tip of the stop hole 1a are connected with the interior chamber of the cylinder. The axial position of the cylindrical fuel injection valve 3, which is inserted in the stop hole 1a with hardly any gap, is determined by a stage part 1b of the stop hole 1a, and the tip part of the fuel injection valve having a fuel injection outlet 3a protrudes into the interior chamber of the cylinder through the hole 1c. One end of a fuel pipe 4 is connected to the part of the fuel injection valve 3 that leads to the outside from the main engine unit (the side opposite the aforementioned injection outlet 3a), fuel is sent in from the fuel pipe 4 and is injected into the interior chamber of the cylinder from the fuel injection outlet 3a. Further, two planar surfaces 3c, which are mutually parallel and are parallel with the axis, and a stage part 3b, which links the planar surfaces and the cylindrical surface in a plane at a right angle to the axis, are provided on the part of the fuel injection valve 3 that leads outward from the main engine unit. The two parallel planar surfaces 3c mate without a gap to fork parts 2d, 2d provided on one end of the retention member, and a pressurizing part 2c, which is at the bottom of the fork part contacts the stage part 3b.

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A shoulder part 2a having a spherical protuberance is provided on the end of the side opposing the fork parts 2d, 2d of the retention member 2, and mates with a depression 1a provided on the main engine unit 1. Further, a hole 2b nearly parallel with the axis of the fuel injection valve is bored in the retention member 2 between the pressurizing part 2c of the lower part of the fork and the shoulder part 2a. A stud 5 that is loosely inserted in this hole 2b meshes with the threads 1d provided in the main engine unit 1, and mounts on the main engine unit. By screwing a nut 6 onto the top of this stud 5 to tighten the retention member 2, the stage part 3b of the fuel injection valve 3 is retained by the pressurizing part 2c using the shoulder part 2a as the point of support, and the fuel injection valve 3 is thus secured. A bolt may be used instead of the stud 5 and the nut 6. At this time, the pressurizing part 2c has a cylindrical surface shape that is broader than the stage part 3b, and the pressurizing part 2c can press down without making the fuel injection valve 3 eccentric to the axial direction.

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Moreover, the interior is tightly sealed by a seal 8, and a head cover 7 is assembled on the upper part of the main engine unit 1.

In a fuel injection valve securing structure configured as described above, the axial movement of the fuel injection valve 3 is restricted and secured by the stage part 1b of the stop hole 1a and the pressurizing part 2c of the retention member 2; the fork parts 2d, 2d provided on one end of the retention member 2 mate with the two parallel planar surfaces 3c of the fuel injection valve 3 without hardly any gap; and the protuberance of the shoulder part 2a provided in the other end mates with the depression 1a of the main engine unit. Therefore, the movement of the retention member 2 in the plane at a right angle to the fuel injection valve 3 is prevented, and the rotational movement of the fuel injection valve 3 is also restricted. Specifically, the rotational position of the fuel injection valve 3 can be determined by the retention member 2.

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Furthermore, it is better if the pressurizing part 2c can move in the axial direction of the fuel injection valve 3 using the protuberance of the shoulder part 2a of the retention member 2 as the point of support, and of the rotational movement of the fuel injection valve 3 can be prevented; and therefore a nearly semi-cylindrical shape may also be used as indicated in Figure 3. In this case, in addition to providing a cylindrical surface at a right angle to the line linking the shoulder part 2a and the fuel injection valve 3, making it possible for the retention member 2 to swing along this cylindrical surface, the fuel injection valve 3 can be mounted without displacement because the side surface of the semicircular protuberance prevents the movement of the retention member 2 in the plane at right angle to the axis of the fuel injection valve.

As explained above, according to the present invention, the fuel injection valve is retained and mounted through a retention member using one bolt, and no positional displacement is produced between the fuel injection valve and the main engine unit. Therefore, the direction of injection of the fuel injection valve can be precisely determined, and the occurrence of problems that are prone to occur when there is displacement of the direction of injection, such as decreased engine start-up characteristics and reduced performance, can be prevented.

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